

# Trading Conduct Report

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## Market Monitoring Weekly Report

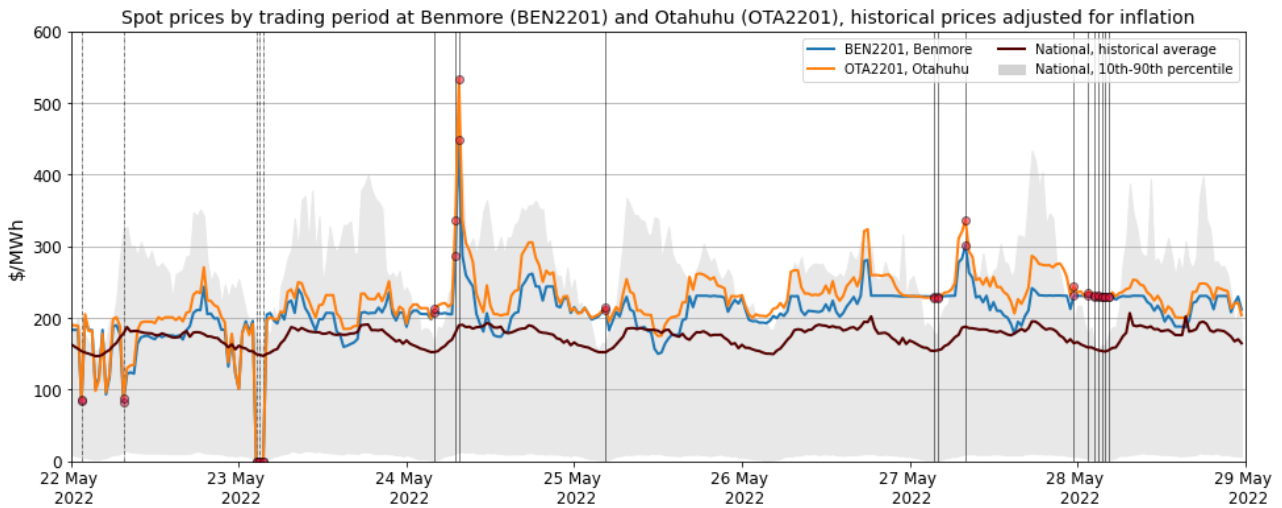
### 1. Overview for the week of 22 to 28 May

- 1.1. Wholesale spot prices this week appear to be consistent with supply and demand conditions.

### 2. Spot Prices

- 2.1. This report monitors underlying wholesale price drivers to assess whether there are trading periods that require further analysis for the purpose of considering potential non-compliance with the trading conduct rule. To do this, we assess whether spot prices are behaving in line with market conditions. In addition to general monitoring, we also single out unusually high-priced individual trading periods for further analysis by identifying when wholesale electricity spot prices at Benmore and/or Otahuhu nodes exceed their historical 90th percentiles. These historically high-priced trading periods are marked out by vertical lines in the majority of figures in this report.
- 2.2. Figure 1 shows wholesale electricity spot prices from the past week at Benmore and Otahuhu alongside their historic mean and historic 10<sup>th</sup>-90<sup>th</sup> percentiles adjusted for inflation. Spot prices between 22 and 28 May were similar to previous weeks averaging \$228.19/MWh across all nodes. 95 per cent of prices fell between \$110.96/MWh and \$291.46/MWh.
- 2.3. There was a noticeable spike in prices on 7:30am 24 May when prices reached as high as \$587.27/MWh. Prices also saw small spikes over \$340/MWh at peak periods on 26 May and 27 May. Similarly to last week some off peak periods displayed higher prices than we have historically come to expect.

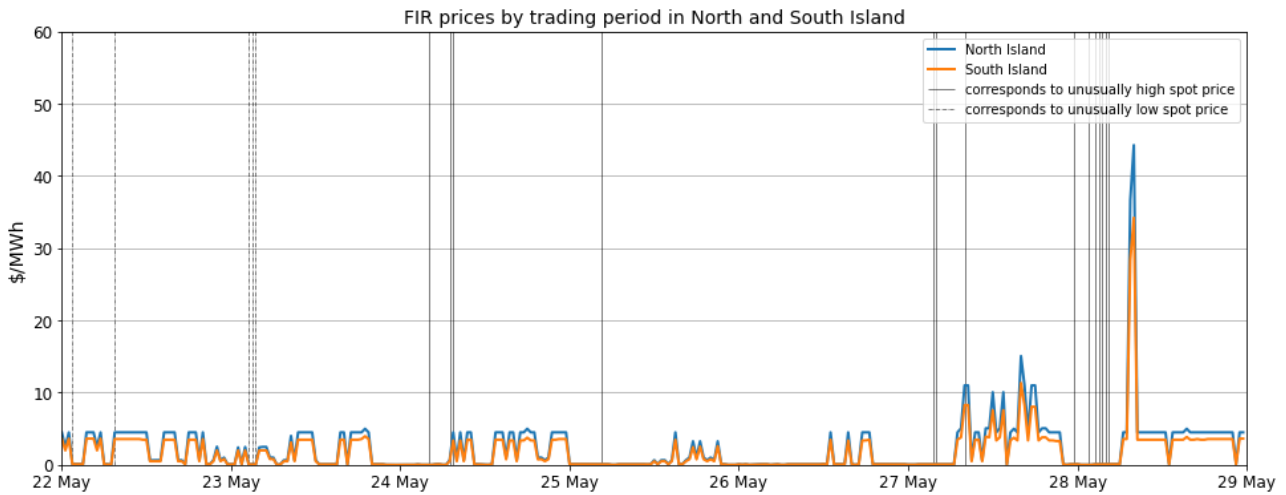
Figure 1: Wholesale Spot Prices



### 3. Reserve Prices

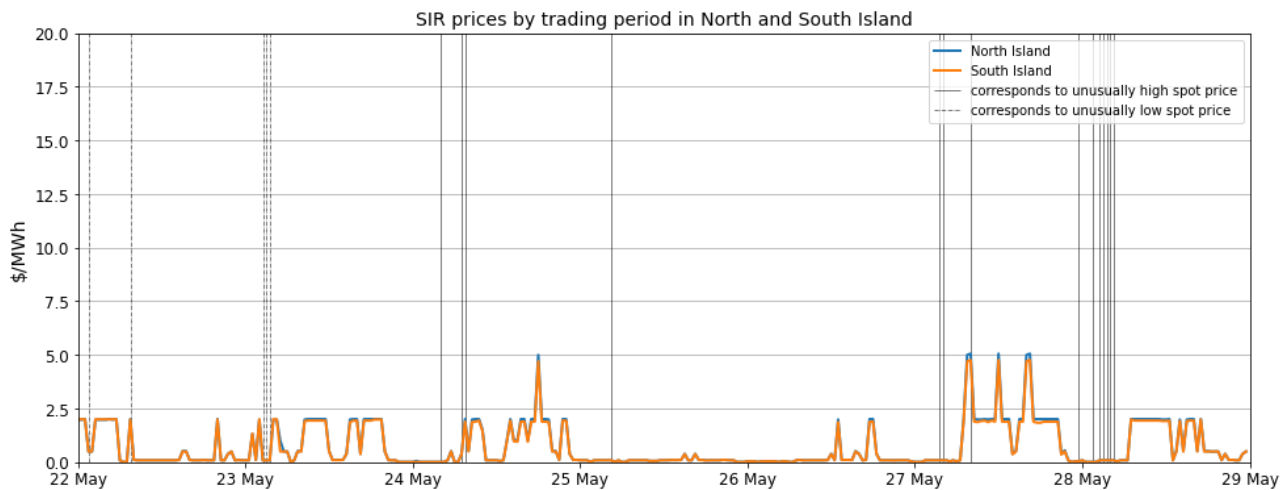
3.1. Fast instantaneous reserves (FIR) prices for the North and South Island are shown below in Figure 2. Most FIR reserve prices this week remained within their normal range at below ~\$5/MWh. FIR prices did rise near the end of the week, likely due to the operator choosing to dispatch lower priced reserves when it looked like energy prices were going to be significantly higher.

Figure 2: FIR prices by trading period and Island



3.2. Sustained instantaneous reserves (SIR) prices for the North and South Island are shown below in Figure 3. SIR reserve prices this week remained within normal bounds at below ~\$5/MWh.

Figure 3: SIR prices by trading period and Island

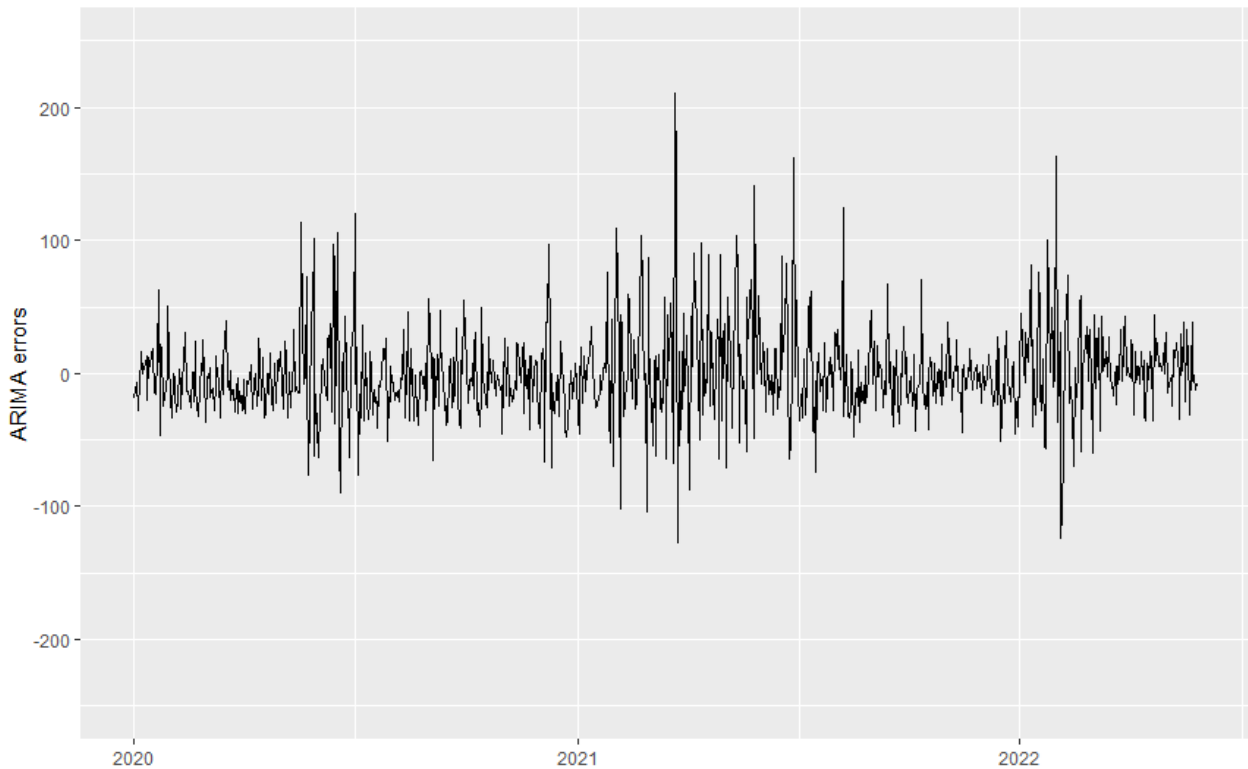


## 4. Regression Residuals

- 4.1. The Authority's monitoring team has developed two regression models of the spot price. The residuals show how close the predicted prices were to actual prices. Large residuals may indicate that prices do not reflect underlying supply and demand conditions. Details on the regression model and residuals can be found in Appendix A<sup>1</sup> on the trading conduct webpage.
- 4.2. Figure 4 shows the residuals of autoregressive moving average (ARMA) errors from the daily model. Residuals were mostly stable this week indicating prices largely aligned with market conditions.

<sup>1</sup> <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-A-Regression-Analysis.pdf>

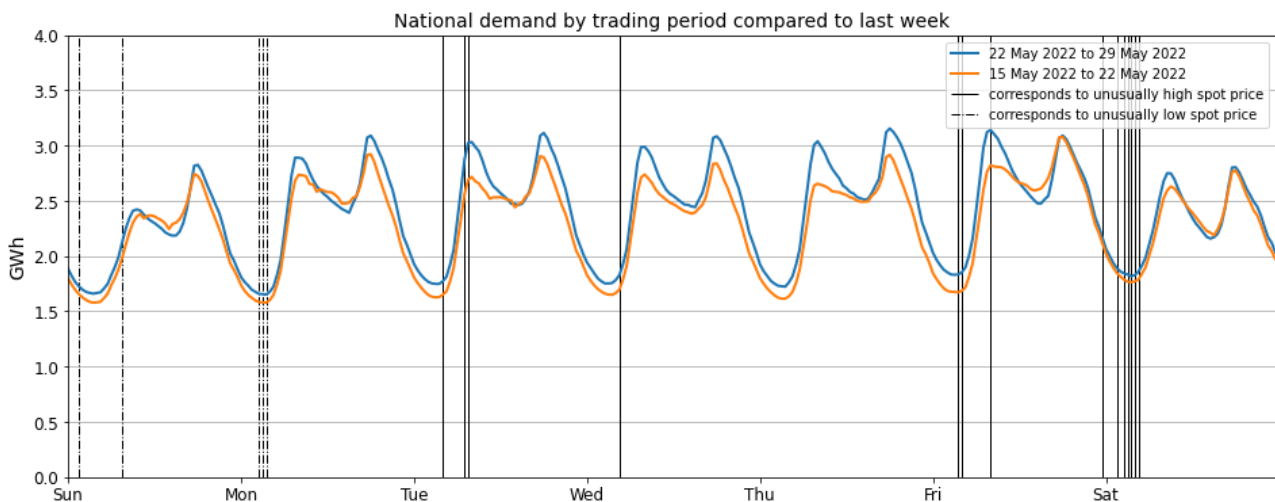
Figure 4: Residual plot of estimated daily average spot price YTD



## 5. Demand

- 5.1. Figure 5 shows this week's national grid demand against national grid demand from the previous week.
- 5.2. Daily demand between 22 May and 28 May compared to daily demand between 15 May and 21 May has noticeably increased. Total demand this week was 794 GWh, 36 GWh higher than the 758 GWh of total demand last week (around a ~4.6 per cent increase). As the increase in demand was relatively evenly spread across each day the rise likely came from declining temperatures as evidenced by the temperature chart below.

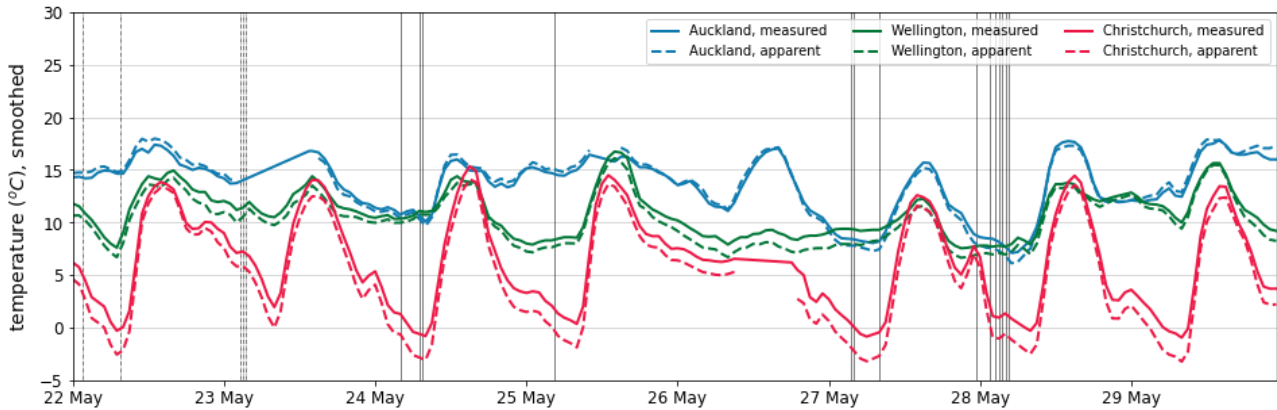
Figure 5: National demand by trading period compared to the previous week



- 5.3. Figure 6 shows hourly temperature at main population centres. The measured temperature is the recorded temperature, while the apparent temperature adjusts for factors like wind speed and humidity to estimate how cold it feels.

5.4. Temperatures at main population centres this week were mostly below 15°C, down 5°C from the previous week, with temperatures in some regions dipping below 0°C at times.

Figure 6: Temperatures across main centres

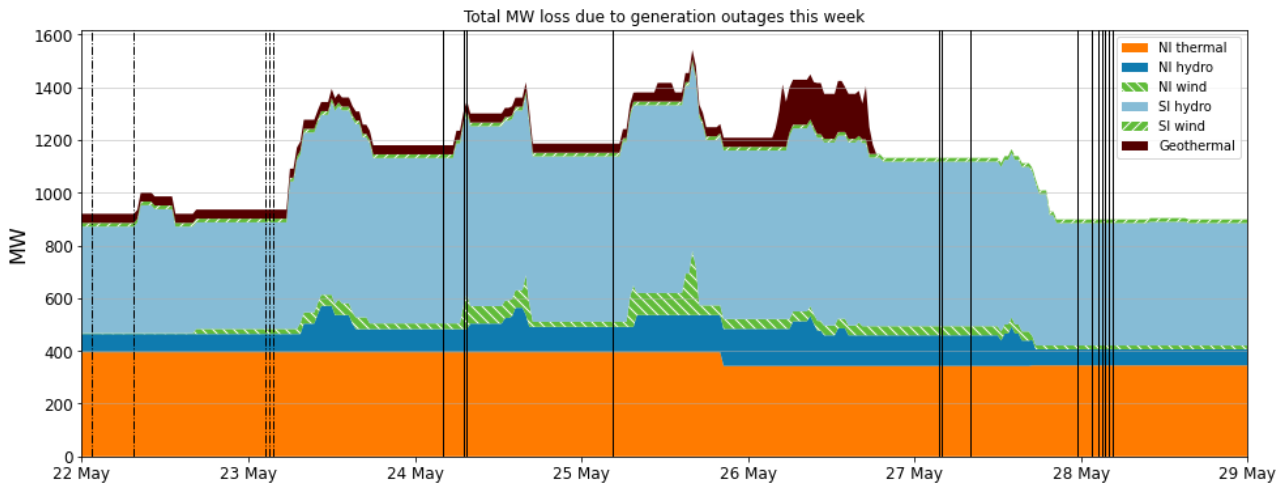


5.5. The decrease in temperatures was likely the main reason for increased demand this week. The increase in demand would also go towards explaining any trading periods with slightly higher spot prices this week. We can see that the historically high prices marked out by solid vertical lines in the chart also coincide with when temperatures were at their lowest points for the week.

## 6. Outages

6.1. Figure 7 shows generation capacity lost due to outages by fuel type. Despite thermal generation outages decreasing, total generation capacity lost due to outages this week has increased - mostly from South Island hydro and some geothermal outages. We would expect the geothermal outages to have caused some steepening of offer price curves as geothermal generation is currently priced lower than thermal and hydro generation.

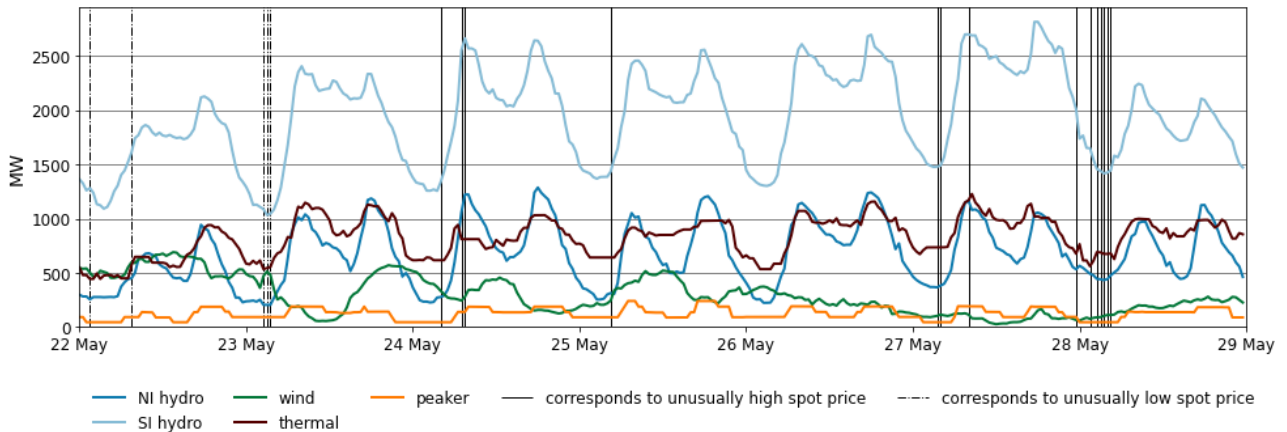
Figure 7: Total MW loss due to generation outages



## 7. Generation

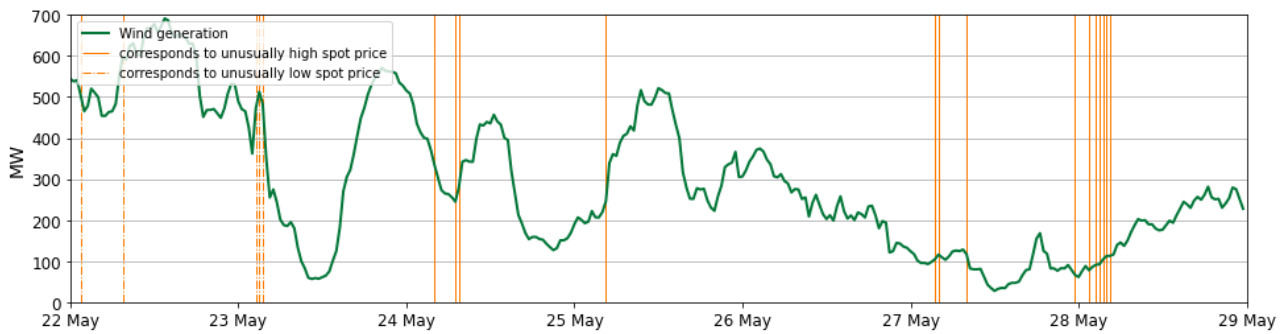
7.1. Figure 8 shows generation by type. Thermal generation increased this week to between ~500 MW and ~1,200 MW. Some of this increase is a result of conservative hydro generation necessitating thermal generation to support more baseload demand as well as make up for any shortfalls in wind generation.

Figure 8: Generation by Type



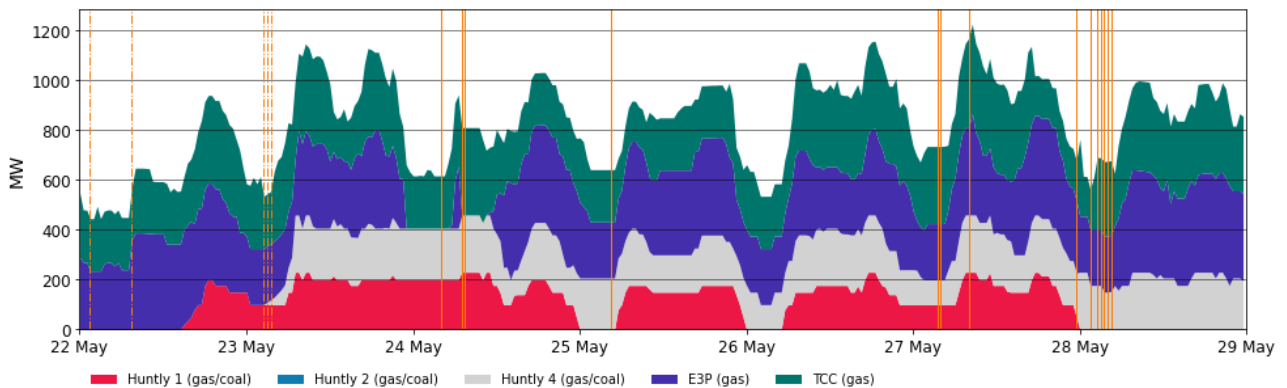
7.2. Figure 9 shows wind generation this week. Despite some volatility wind generation trended down, going from over 500 MW at the beginning of the week to below 200 MW near the end of the week. The decline in wind generation near the end of the week combined with high demand resulted in an increase in thermal generation and higher off-peak demand prices than we would usually expect on 27 and 28 May.

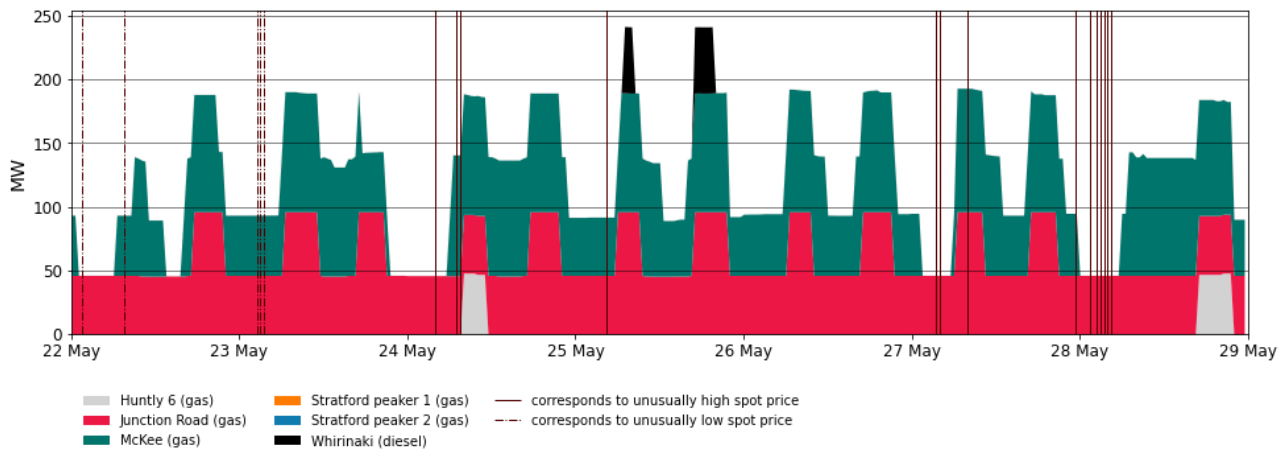
Figure 9: Wind Generation



- 7.3. Figure 10 shows generation at thermal and thermal peaker plants. TCC ran for the entire week, adding around an extra ~200 MW of generation. The addition of generation from TCC helped to offset the pressure from increased demand.
- 7.4. Prices peaked briefly when E3P stopped generating on 24 May. The reason for E3P's lack of generation on 23 and 24 May is currently being looked into.
- 7.5. Whirinaki ran briefly on 25 May with Stratford peaker remaining idle.
- 7.6. With the current high cost of thermal fuels, the high amount of thermal generation continues to be a large contributor to high spot prices.

Figure 10: Thermal Generation

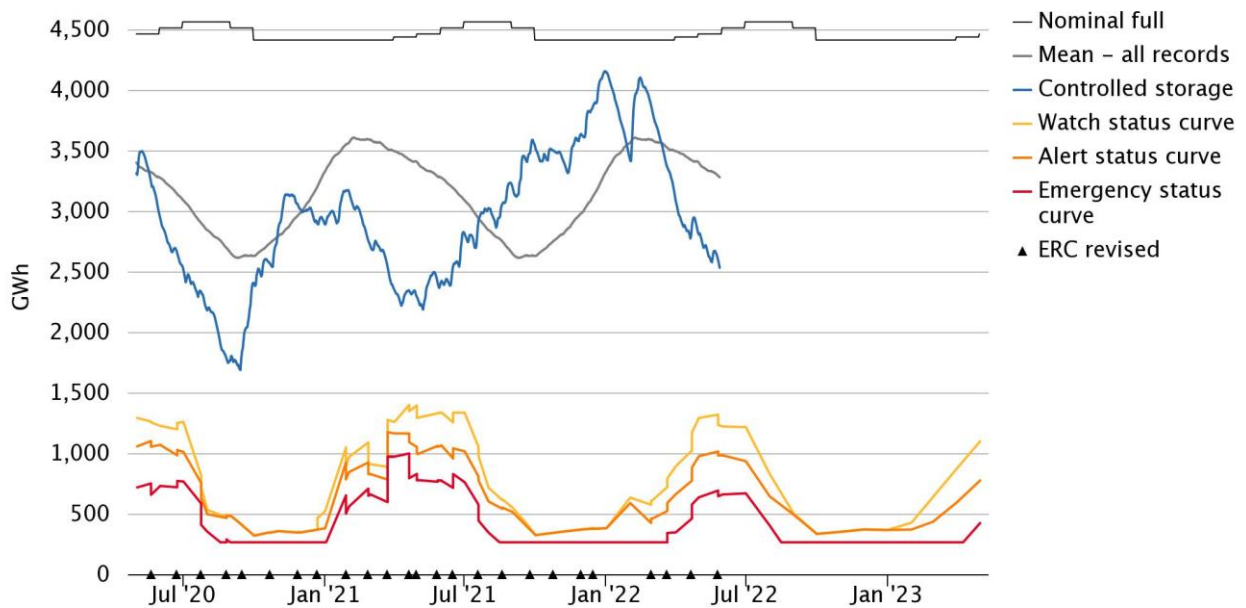




## 8. Storage/Fuel Supply

8.1. Figure 11 shows total controlled national hydro storage. Gains from the previous week were lost this week with total hydro storage falling to its lowest point this year at just above 2,500 GWh. The decline in hydro storage continues to increase the opportunity cost of hydro generation contributing to current high spot prices.

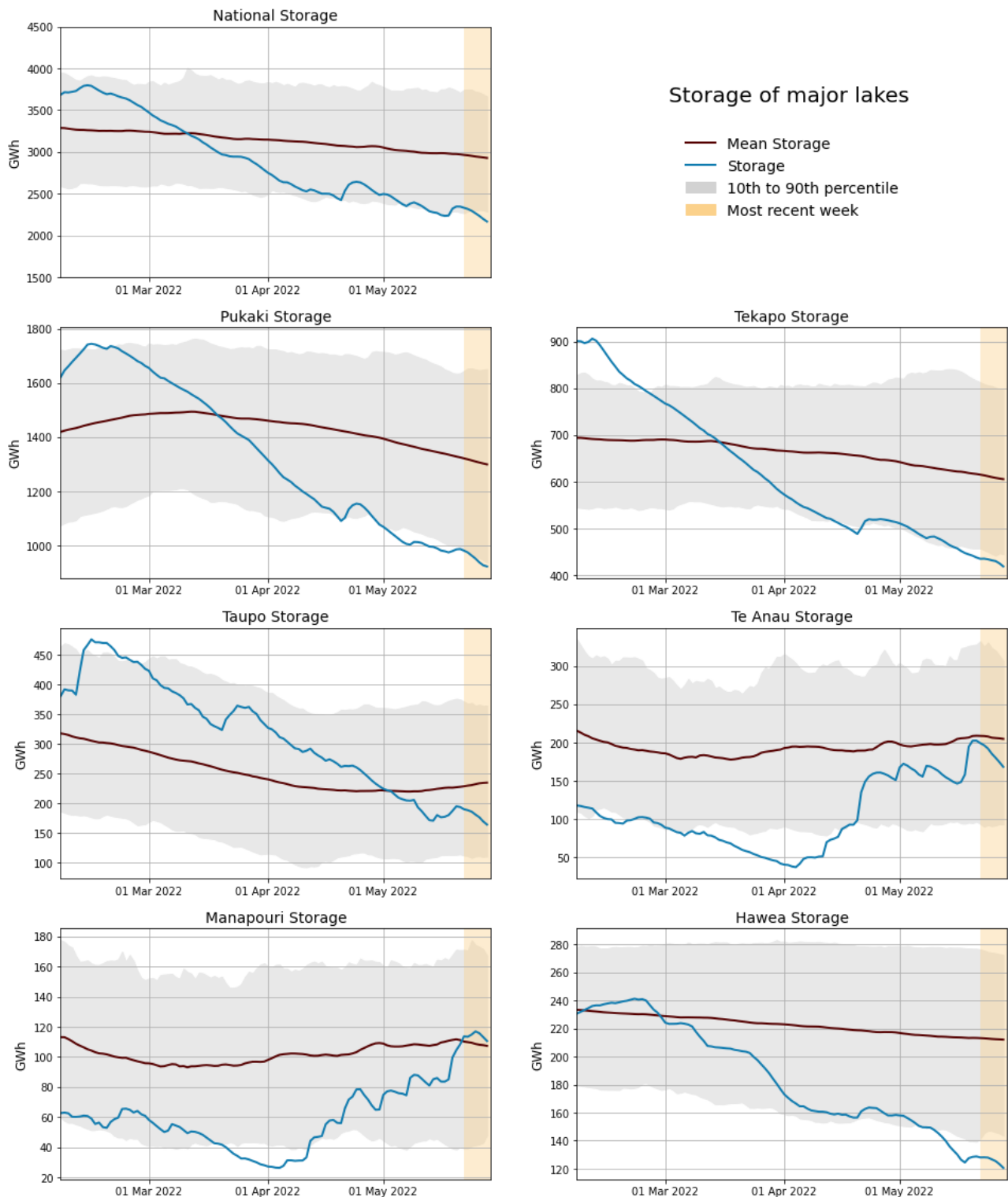
Figure 11: Hydro Storage



emi.ea.govt.nz/r/gqgk4

8.2. Figure 12 shows hydro storage at major lakes compared to their historic average and historic 10<sup>th</sup>-90<sup>th</sup> percentiles. Storage levels at Lakes Manapouri and Te Anau have improved to near their historic means. Storage levels at remaining South Island lakes however continue to fall below their 10<sup>th</sup> percentiles. Lake Taupo has also declined to below its historic mean.

Figure 12: Major Lake Storage



## 9. Price versus estimated costs

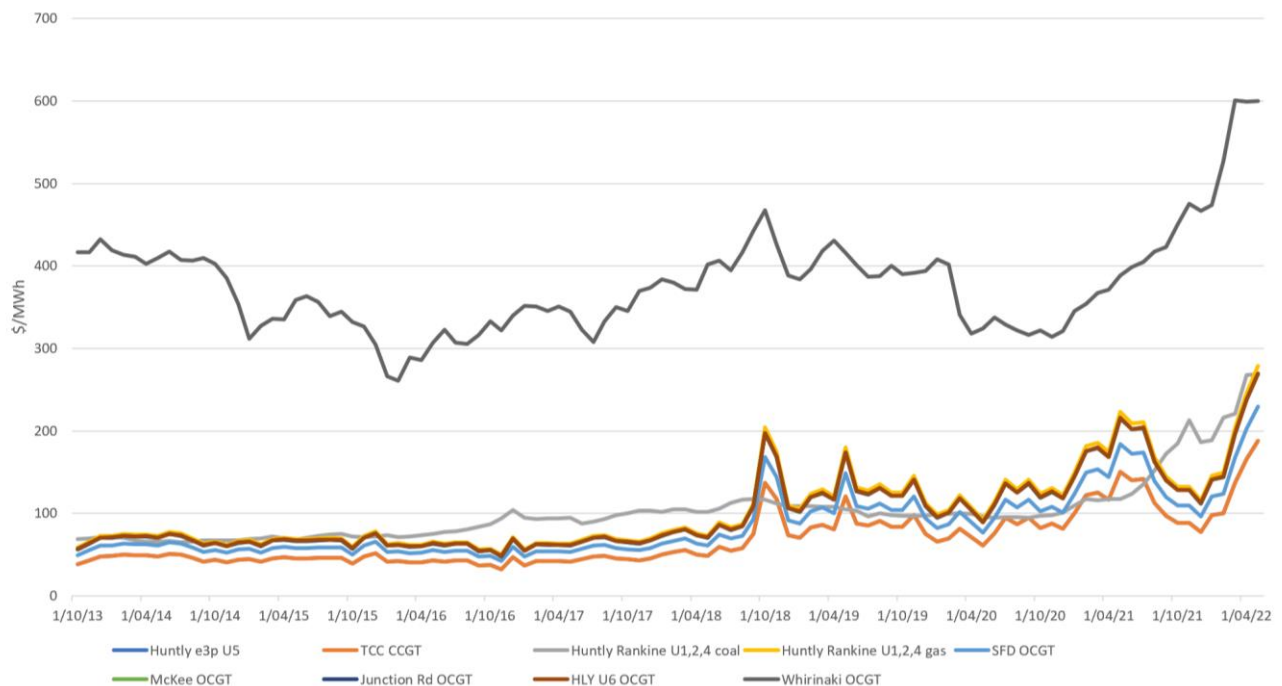
- 9.1. In a competitive market, prices should be close to (but not necessarily at) the short run marginal cost (SRMC) of the marginal generator (where SRMC includes opportunity cost).
- 9.2. The SRMC (excluding opportunity cost of storage) for thermal fuels can be estimated using gas and coal prices, and the average heat rates for each thermal unit. Note that the SRMC calculations include the carbon price, an estimate of operational and maintenance costs, and transport for coal. Figure 13 shows an estimate of thermal SRMCs as a monthly



average up to 1 May 2022. The SRMC of all plants has increased sharply since the beginning of 2022.

- 9.3. The SRMC of coal and diesel have both increased due to global supply and demand conditions. As well as supply disruptions caused by Covid, the Russian-Ukraine conflict has increased the premium on all international coal due to sanctions placed on Russia. Recently the international unit cost in terms of USD has dropped for coal indicating prices are settling. The reductions in market prices have not necessarily materialized for local consumers however due to increased inflation and a weakening NZD. Coal prices in NZD are currently around \$420/tonne. Limited local gas production has also put a premium on gas spot prices with the current month long full field outage at Maui gas field (14 May-8 June) pushing the VWAP of gas spot prices to around ~\$25/GJ. High historical carbon prices have also affected thermal generation costs with prices on the secondary market currently averaging ~\$77/tonne. This puts the latest SRMC of Huntly generation at above ~\$270/MWh.

Figure 13: Estimated monthly SRMC for thermal fuels



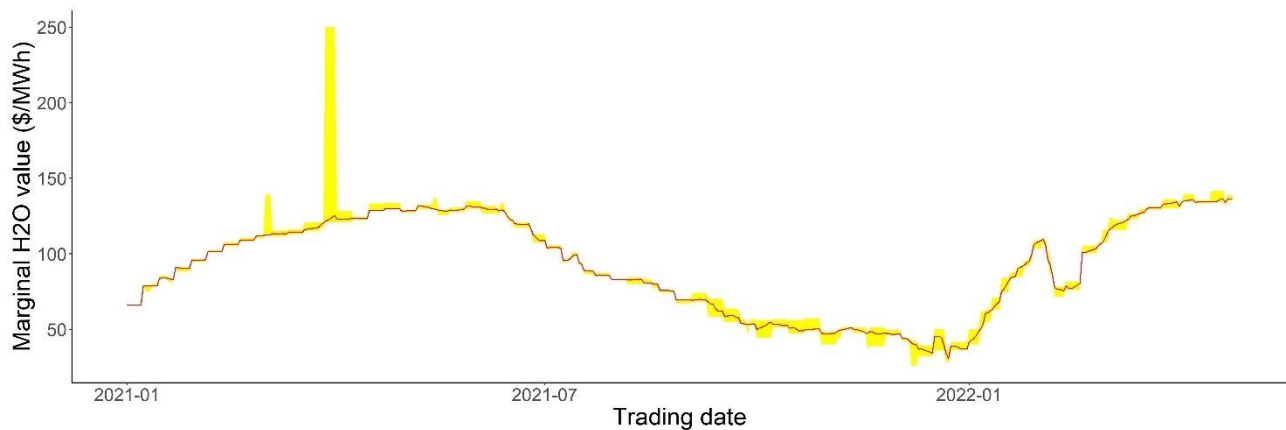
## 10. JADE Water values

- 10.1. The JADE<sup>2</sup> model gives a consistent measure of the opportunity cost of water, by seeking to minimise the expected fuel cost of thermal generation and the value of lost load and provides an estimate of water values at a range of storage levels. Figure 14 shows the national water values to 31 March 2022 using values obtained from JADE. The outputs from JADE closest to actual storage levels are shown as the yellow water value range. These values are used to estimate marginal water value at the actual storage level. More details on how water values are calculated can be found in Appendix B<sup>3</sup> on the trading conduct webpage.
- 10.2. In general, marginal water values have increased when total national hydro storage has decreased. For the last two months water values have been gradually increasing as hydro storage has declined. As at 31 March 2022 water values were almost \$150/MWh.

<sup>2</sup> JADE (Just Another DOASA Environment) is an implementation of the Stochastic Dual Dynamic Programming (SDDP) algorithm of Pereira and Pinto. JADE was developed by researchers at the Electric Power Optimisation Centre (EPOC) for the New Zealand electricity market.

<sup>3</sup> <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-B-JADE-water-value-model.pdf>

Figure 14: Water Values



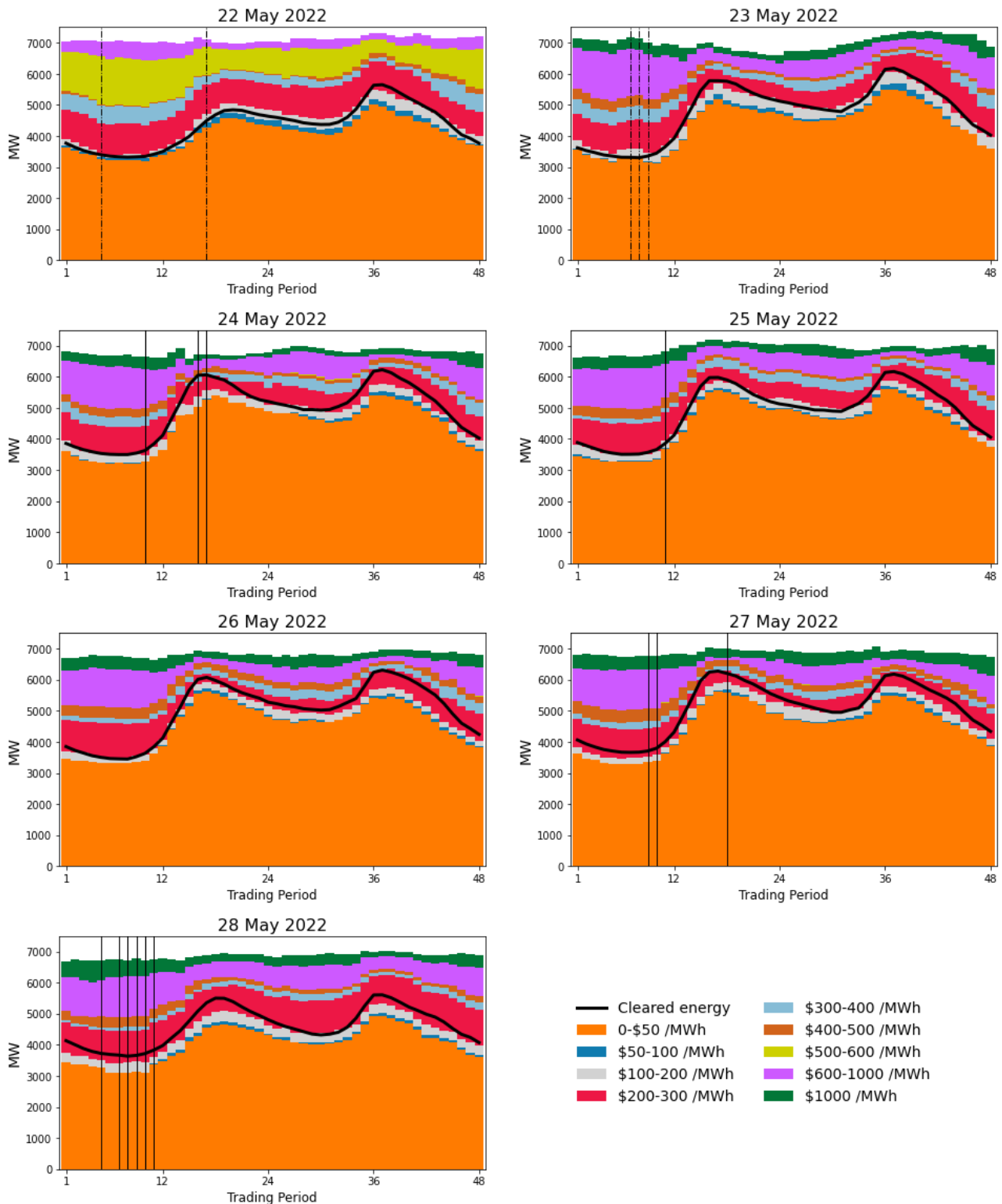
## 11. Offer Behaviour

- 11.1. Figure 15 shows this week's daily offer stacks, adjusted to take into account wind generation, transmission constraints, reserves and frequency keeping.<sup>4</sup> The black line shows cleared energy, indicating the range of the average final price.
- 11.2. High thermal and hydro generation opportunity costs as detailed above continue to drive a steep offer curve.
- 11.3. The amount of lower priced \$0/MWh to \$100/MWh offers this week has increased (to 5,385 MW from 4,920 MW in the previous week), likely to cover the increase in demand. The arrangement of higher tranche offers however remains similar to the previous week. The increase in lower priced offers has meant despite increased demand spot prices were still similar to last week, with cleared generation mainly falling within the same price bands.

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<sup>4</sup> The offer stacks show all offers bid into the market (where wind offers are truncated at their actual generation and excluding generation capacity cleared for reserves) in price bands and plots the cleared quantity against these.

Figure 15: Daily offer stack



## 12. Ongoing Work in Trading Conduct

- 12.1. An increase in demand, low wind generation and high thermal generation combined with high thermal fuel costs were the main driving forces behind high spot prices this week.
- 12.2. The ~\$500/MWh peak in prices seen on the 24 May were a result of unusually high peak demand and the loss of generation from E3P pushing prices up.

12.3. Higher than average prices during morning off peak periods earlier last week were due to lower than usual thermal generation – partially from TCC not running – resulting in highly priced thermal peaker generation being dispatched.

12.4. Further analysis is being done on the trading periods in Table 1 as indicated.

*Table 1: Trading periods identified for further analysis*

<b>Date</b>	<b>TP</b>	<b>Status</b>	<b>Notes</b>
<b>19/02-24/02</b>		Compliance enquiries in progress	After reviewing information received from Genesis regarding offers from Tekapo B while Lake Tekapo was spilling, this case has been passed to compliance to assess if the offers were compliant with trading conduct rules.
<b>19/02-21/02</b>	Several	Further Analysis	Further information has been received and will be further analysed
<b>30/06/21-20/08/21</b>	Several	Compliance enquiries in progress	The Authority's compliance team has obtained information regarding withdrawn reserve offers and high energy prices. Further clarification and analysis is under way to consider compliance with the Code.
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